

CALIFORNIA HIGH-SPEED TRAIN

Project Environmental Impact Report /
Environmental Impact Statement

DRAFT

Bakersfield to Palmdale Section Supplemental Alternatives Analysis Report Volume 1

February 2012



CALIFORNIA
High-Speed Rail Authority



U.S. Department of Transportation
Federal Railroad Administration



CALIFORNIA HIGH-SPEED TRAIN PROJECT EIR/EIS

DRAFT

Bakersfield to Palmdale Section
Supplemental Alternatives Analysis
Report Volume 1

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URS/HMM/Arup Joint Venture

February 2012

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ABBREVIATIONS/ACRONYMS

- AA Alternatives Analysis
Authority California High-Speed Rail Authority
BLM Bureau of Land Management
Caltrans California Department of Transportation
CPUC California Public Utilities Commission
EIR Environmental Impact Report
EIS Environmental Impact Statement
FAA Federal Aviation Administration
GIS Geographic Information System
HST High-Speed Train
SR State Route
UPRR Union Pacific Railroad

1.0 Supplemental Alternatives Analysis Report

Introduction

This February 2012 Bakersfield to Palmdale Supplemental Alternatives Analysis (AA) Report updates the Preliminary AA Report issued by the California High-Speed Rail Authority (Authority) in September 2010. This Supplemental AA was prepared to document additional evaluation, development, and refinement of the alignment alternatives, and to present the recommended modifications to the original Preliminary AA alternatives to be studied further as part of the Environmental Impact Report/Environmental Impact Statement (EIR/EIS) preparation process. This Supplemental AA responds specifically to the Authority's concerns about reducing environmental impacts and overall project costs. Potential land use conflicts, wetland issues, and other potential environmental impacts, project purpose/objectives and requirements, and stakeholder input (described in Section 1.1) were considered in modifying the alternatives. In addition, the higher costs associated with elevated profiles and tunneling were reduced by increasing track grade; lowering HST profiles, and bringing them close to grade; and reducing tunnel length where possible. The modified alternatives are indicated as "New" in this report, as well as in the plan and profile drawings presented in Appendix C, Volume 2, to easily identify them from the original Preliminary AA alternatives.

This Supplemental AA also differs from the Preliminary AA Report in that the geographic area covered in the Supplemental AA now extends all the way to the two current HST Palmdale Station options. The Preliminary AA stopped at Avenue M, the city boundary between Lancaster and Palmdale, because HST routes from Avenue M to the two station options had not been developed as of the date of the Preliminary AA. Those routes, called "tie-ins," have now been developed, and are discussed in Section 1.4. A study area map is shown on Figure 1.0-1.

Background

To facilitate the analysis of potential alignment alternatives and design options, the Bakersfield to Palmdale Section has been divided into three subsections (Figure 1.0-1). The subsections, listed from north/west to south/east, are:

- Edison Subsection.
- Tehachapi Subsection.
- Antelope Valley Subsection.

Figure 1.0-2 illustrates the previously advanced alignment alternatives from the September 2010 Authority Board meeting.

Summary of this Supplemental AA

The following sections summarize the additional evaluation, development, and refinement of the Preliminary AA alternatives, provided through this Supplemental AA.

Edison Subsection:

- The Preliminary AA alternatives (Preliminary AA E2A, Preliminary AA E2B, and Preliminary AA E4) through East Bakersfield and the town of Edison consist of a combination of elevated and at-grade profiles. To contain costs, these alternatives were refined into two primarily at-grade profile configurations ("New E2" and "New E4") that applied to several points along the length of the Edison Subsection.

Figure 1.0-1. Bakersfield to Palmdale Subsections

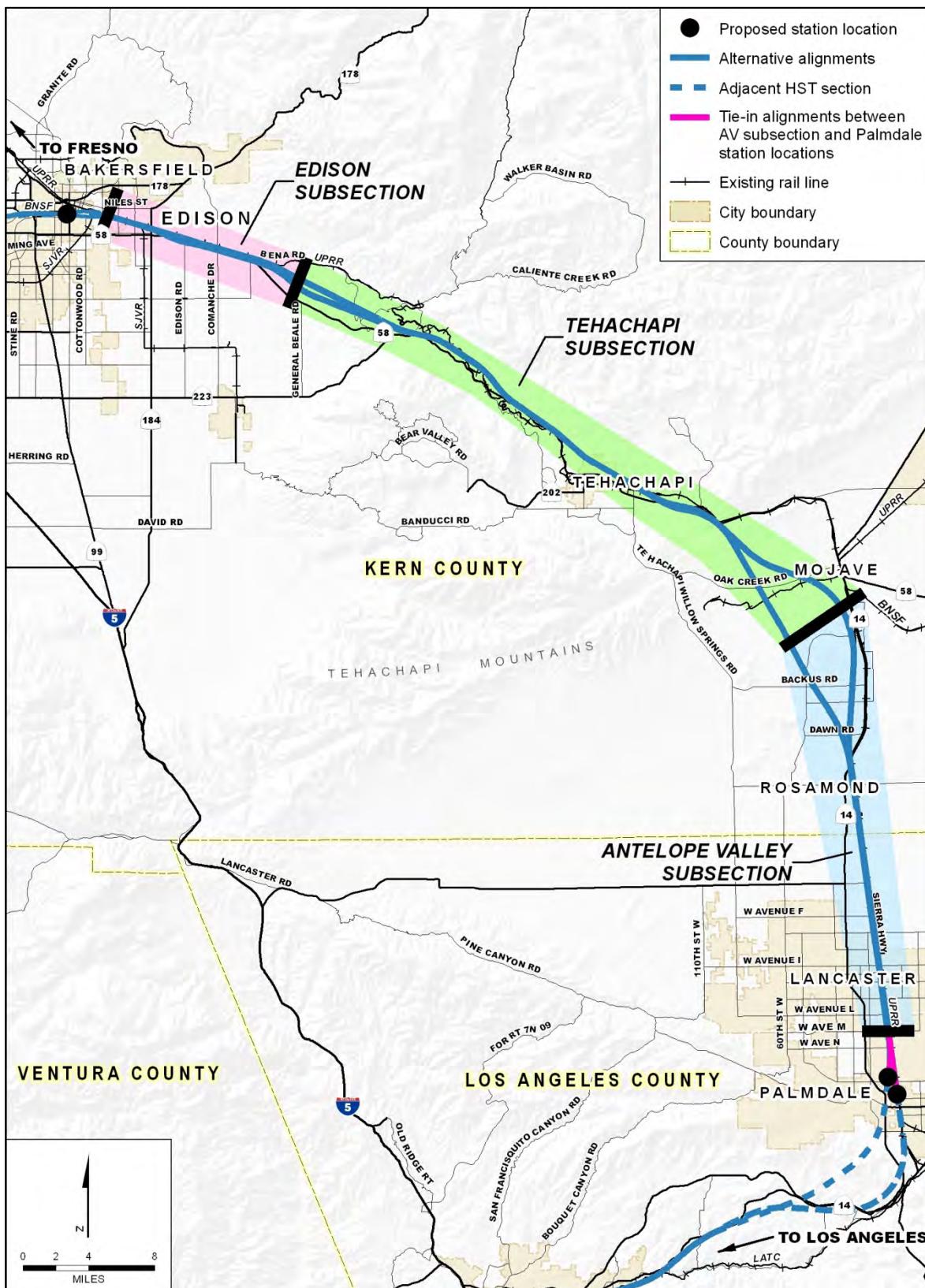
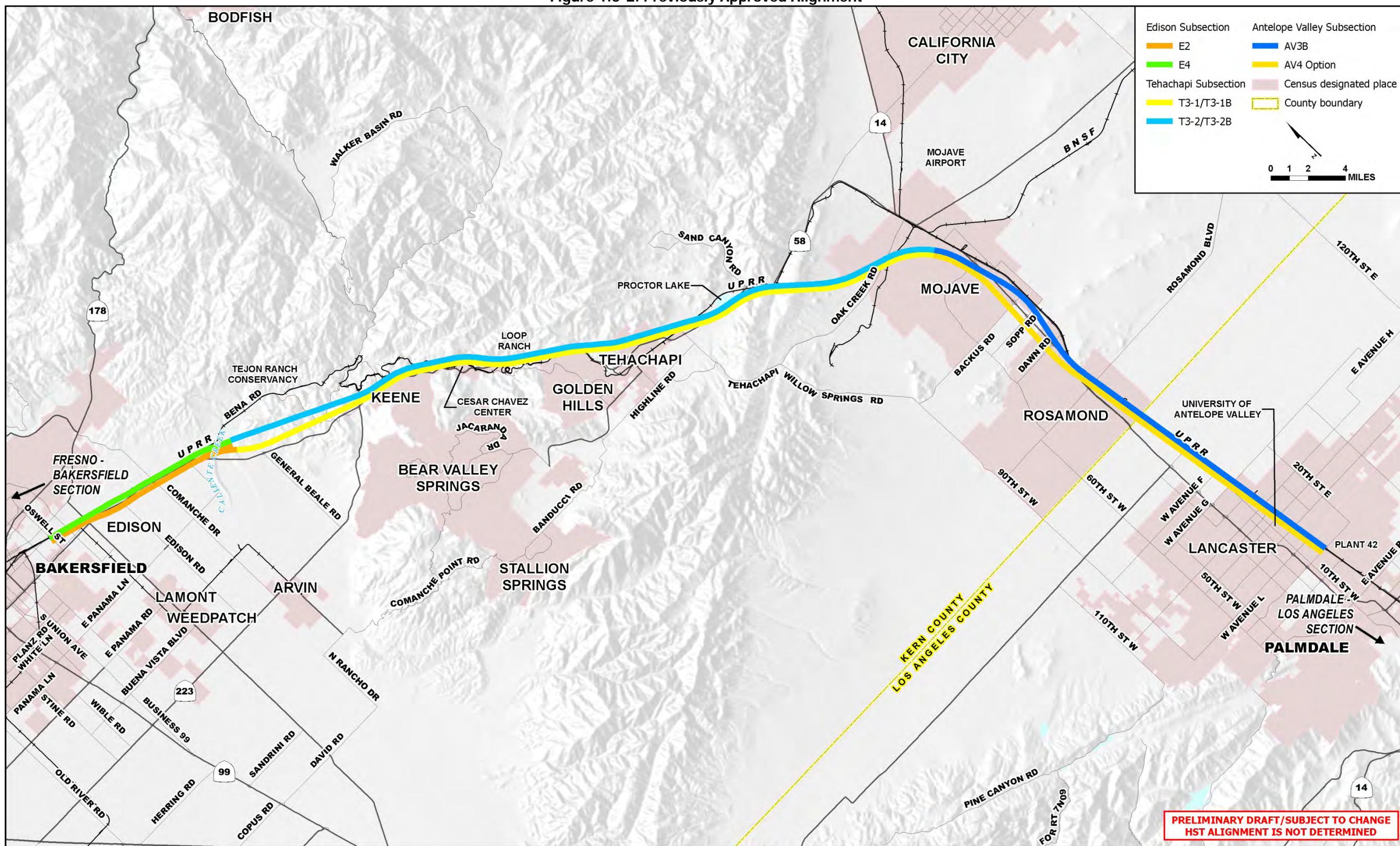


Figure 1.0-2. Previously Approved Alignment



Tehachapi Subsection:

- A new alternative (“New T3”) was developed that follows the Preliminary AA T3-1 alignment at an increased grade (from 2.5% and 2.75% to a 3.3% grade over 8 miles) through the Tehachapi Mountains, thereby decreasing the length of elevated structures and tunnels (and as well as decreasing the cost) through mountainous terrain. New T3 also deviates from the Preliminary AA T3-1 alignment at Proctor Lake to reduce wetland impacts. In the Mojave, New T3 follows a shorter, more direct route that avoids potential conflicts with the Mojave Airport County Land Use Plan and the Los Angeles Department of Water and Power transmission lines, and eliminates the need for Federal Aviation Administration (FAA) authorization (see Figure 1.0-3).
- The Preliminary AA included alternatives that incorporated a short, level section in the mountainous terrain to allow the trains to pass through an area that would not have access to traction power (called the phase break). Revised traction power calculations by the Authority supported withdrawing the phase-break alternatives (Preliminary AA T3-B and Preliminary AA T3-2B) and incorporating profiles in the alternatives carried forward that would allow a slightly steeper grade through the phase break portion of the alignment.

Antelope Valley Subsection:

- The Preliminary AA alternatives (Preliminary AA AV3B and the Preliminary AA AV4 Option) through Rosamond and Lancaster are elevated. To contain costs, these alternatives were modified (“New AV3B” and “New AV4 Option”) to travel the length of Rosamond and Lancaster at-grade.
- Two potential HST station locations are being considered in Palmdale: Palmdale Transportation Center Station (State Route [SR] 14 East), and Palmdale West Station (SR 14 West). Tie-in alignments have been developed to connect the Antelope Valley alternatives in Lancaster with the Palmdale station locations. These tie-ins are presented in Section 1.4, and the related plan and profile drawings are incorporated into Appendix D, Volume 2. The tie-ins ensure that a connection between either of the two Antelope Valley alternatives and either Palmdale station location is possible, in accordance with the Authority’s engineering design standards. The plans and profiles for the tie-in alignments were developed to reflect concerns expressed by stakeholders regarding environmental issues, such as potential land use and circulation conflicts, as well as visual and air safety concerns (refer to Section 1.1 for a description of individual stakeholder concerns). The tie-ins will be further studied during the next phase of engineering (15% design) and the Draft EIR/EIS preparation process.

The Preliminary AA alternative alignments, and the revisions to those alignments, are described in detail in Sections 1.2 to 1.4.

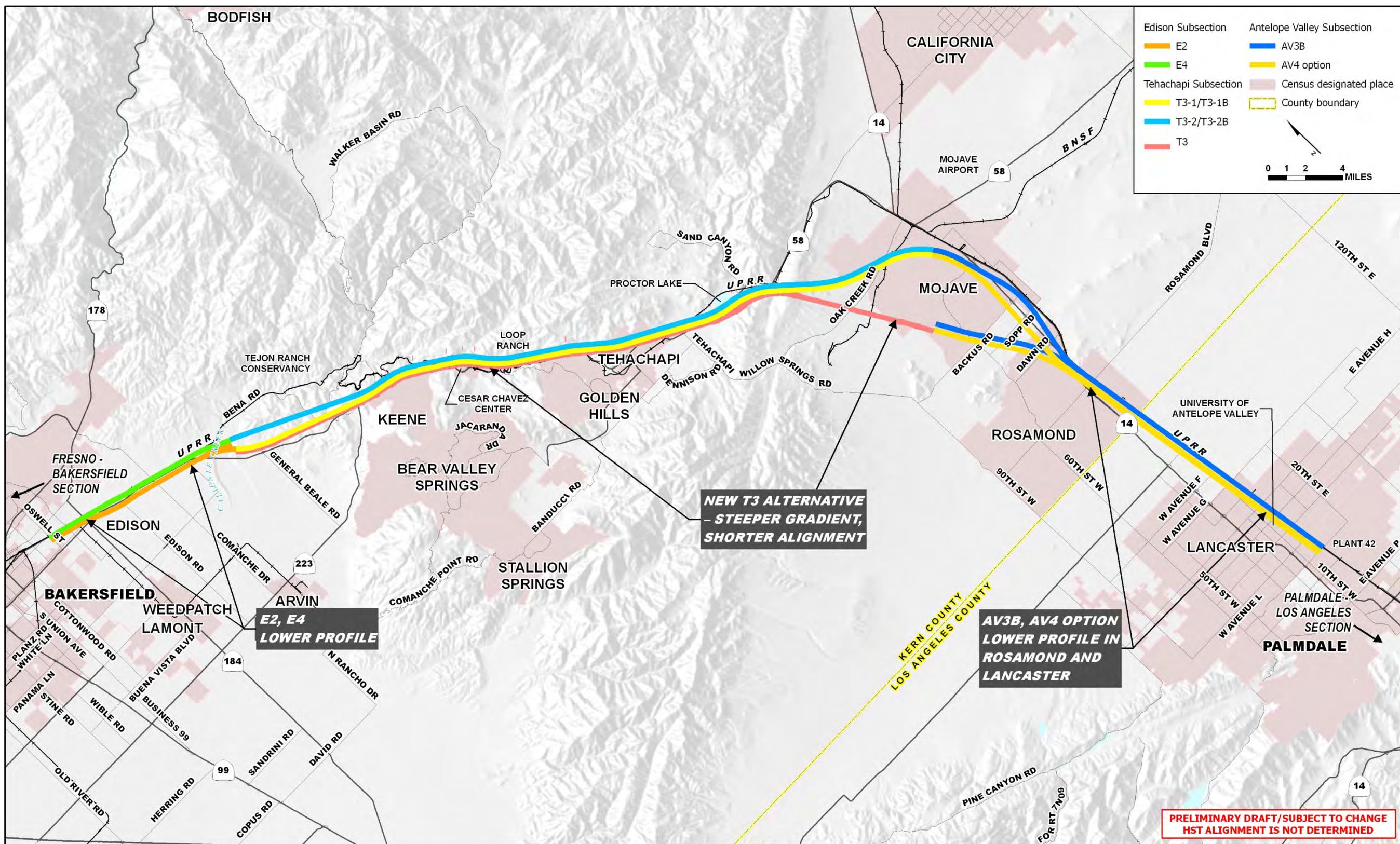
Community Outreach

Since the Preliminary AA was released on September 2, 2010, the project team has met with elected officials and staff, key stakeholders (indicated below), and the public throughout the Bakersfield to Palmdale Section, including Kern County; the cities of Tehachapi, Lancaster, and Palmdale; and the communities of Edison, Rosamond, and Golden Hills. A detailed list of these meetings is provided in Appendix B, Volume 2. The list includes outreach meetings held from May 26, 2010 (from the last meeting detailed in the September 2010 Preliminary AA Report) to November 2011.

Concerns expressed during these meetings included noise/vibration; eminent domain; grade crossings; current and future development plans; project funding; vehicle access and circulation; urban design; impacts on agricultural lands and businesses; irrigation and hydrology; biological habitat and wildlife circulation; potential conflicts with planned energy projects; and Plant 42 defense contractor concerns. Each of these concerns is described below and will be studied in greater detail during the Draft EIR/EIS preparation process.



Figure 1.0-3. Previously Approved Alignments and Proposed Alignment Revisions Considered



Corridor Counties, Cities, and Communities

- **Kern County Planning Department**

Kern County Planning staff indicated that Kern County's long-range transportation plans include upgrading major north-south roads near Edison. Because these roads cannot be severed, multiple grade separations would need to be constructed over the HST alignment, Sierra Highway, and the Union Pacific Railroad (UPRR), which parallel each other. Kern County staff expressed concern that connecting ramps from the new grade separations to Sierra Highway would cross the UPRR at-grade, producing new safety hazards. In the vicinity of Mojave, Kern County is reviewing plans to construct wind farms and solar facilities that the HST alignment may traverse. Kern County planners expressed concern that shortly after coming on-line, the energy projects would have to be altered or displaced due to constructing the HST alignment on project lands. Without replacement sites established, fulfilling power generation commitments made to major utility companies by wind and solar developers may become problematic. Kern County confirmed that 400-foot wind turbines are now being permitted in Mojave Airport County Land Use Plan restricted zones that would be traversed by the Preliminary AA alternatives: T3-1 and T3-2. In this area, Preliminary AA T3-1 and Preliminary AA T3-2 could affect three wind turbine development projects and two solar projects currently under County review. The New T3 alignment would affect one major wind development currently permitted for construction, but it would not affect any planned solar projects.

- **Community of Edison**

Edison agricultural businesses that line Edison Highway are concerned that, under New E4, realigning Edison Highway through town, and the placement of piers for the HST elevated structures, would interfere with truck circulation and shipping operations for these businesses, increasing the potential for vehicular accidents along Edison Highway. In addition, Kern County expressed concern that new overpasses needed for north-south arterials to pass over the HST at-grade would require ramps that would need to cross the UPRR at-grade, in order to maintain access from the arterials to Edison Highway. The railroad grade crossings would create a new safety hazard that Kern County and the California Public Utilities Commission (CPUC) would oppose. The Edison School District Superintendent is concerned that the HST elevated structures for New E4 would intrude into the Edison Middle School recreational area, requiring safety and security mitigations, and displacement of school land.

- **City of Tehachapi**

The HST alternatives are located north of the city of Tehachapi in an open area that is being planned for mixed-use development. The city, which is preparing a general plan update and programmatic EIR that includes a concept plan for the proposed development, has requested the HST tracks be placed in a cut that either can be covered or bridged; or in a tunnel to allow development to occur on both sides of the HST alignment.

- **Kern County Mojave Air and Space Port**

The Mojave Air and Space Port lies within 3 miles of the Preliminary AA alternatives, triggering the automatic filing of the appropriate approval request forms for FAA review. The New T3 alternative would be located much further south of Mojave Airport than the Preliminary AA T3-1 and Preliminary AA T3-2 alignments. As a result, the New T3 alignment would not be subject to County land use restrictions near the airport, or FAA review requirements. Airport staff prefers this new alignment to Preliminary AA T3-1 and Preliminary AA T3-2.

- **Community of Rosamond**

The Rosamond Community Services District General Manager requested that any displaced businesses along the western side of Sierra Highway be relocated in consultation with the

District, and that access roads serving Edwards Air Force Base (Rosamond Boulevard and Avenue A) be grade-separated over or under the HST at-grade tracks. In response to the Authority's proposal to lower the HST profile to grade through the community, the District requested that roadway underpasses (not overpasses) be constructed at Rosamond Boulevard and Avenue A. Grade separation at Patterson Road was considered less critical, although access from Sierra Highway to the sewage treatment plant on Patterson Road must be maintained. The District prefers New AV3B, located between the UPRR and Sierra Highway, to the New AV4 Option, which is aligned through the commercial area on the western side of Sierra Highway.

- **City of Lancaster**

City staff accepts the possibility of realigning Sierra Highway from Avenue K to Avenue M to accommodate an at-grade HST alignment, which would result in displacing properties in this area. City staff expressed concern that the access ramps connecting new east-west grade separations with Sierra Highway could segment developable parcels, and create unsafe radius curves for the new ramps. City staff requested collaboration with the HST engineering team to refine roadway, ramp, and grade-separation designs for Avenues K, L, and M. In response to the Authority's proposal to lower the HST profile to grade throughout the city, city staff requested that roadway underpasses—not overpasses—be constructed to provide grade separation of east-west arterials, as appropriate. Underpasses would be less disruptive to neighboring uses, and may require less extensive roadway construction to maintain access between east-west arterials and Sierra Highway. Because the New AV3B alignment would minimize access impacts to and displace fewer existing land uses, city staff prefers this alternative to the New AV4 Option, which is aligned through the commercial area on the western side of Sierra Highway. Furthermore, staff suggested that the Authority consider shifting New AV3B into the UPRR right-of-way to avoid realignment of Sierra Highway.

- **City of Palmdale**

Although the city supports the project, city staff requested that the HST tie-in alignments between Avenue M and the Palmdale station locations retain sufficient right-of-way for future Sierra Highway expansion. Staff also requested that a new Avenue M overcrossing be constructed as close as possible to the existing Avenue M alignment at Sierra Highway, and that access to Sierra Highway from Avenue M be maintained. Concerns were raised about the possible displacement of a retention basin along Sierra Highway, and the effect of an at-grade HST alignment on the profile of the proposed California Department of Transportation (Caltrans) Desert Connector roadway, which crosses the HST alignments near Avenue O. In addition, Lockheed Martin requested that the realignment and redesign of Sierra Highway—to accommodate an at-grade HST alignment—incorporate visual screens at locations where Sierra Highway would be elevated over the HST near Lockheed Martin's hangars. These concerns have been addressed when developing plans and profiles for the tie-in alignments (Appendix D, Volume 2). Northrup Grumman requested a meeting with the team to discuss possible impacts of HST on defense projects planned at Plant 42. City staff expressed interest in continuing to be updated on alignment refinements along Sierra Highway, and grade separation proposals for Avenue M and other locations along Sierra Highway.

Other Key Stakeholders

- **Bureau of Land Management**

The Bureau of Land Management (BLM) staff has been sharing GIS data of their properties west of Mojave that the HST alignment will pass through. Staff indicated that threatened and endangered species and paleontological resources in the Mojave area need to be considered in the project environmental analysis. Preliminary AA T3-1 and Preliminary AA T3-2 traverse multiple parcels of BLM property in the vicinity of the community of Mojave that New T3 would

avoid. If the HST were to traverse BLM land, an easement from the BLM would have to be formalized to allow construction on BLM land. New T3 obviates the need for an easement from BLM.

- **Tejon Ranch Conservancy/Tejon Ranch**

This year, Tejon Ranch formalized an agreement with the Tejon Ranch Conservancy and other conservation groups to maintain and protect undeveloped ranch lands in exchange for permission to develop a portion of the ranch along I-5. The conservation easement encompasses the area north of SR 58 and east of Caliente Creek traversed by the HST alignment. The Conservancy requested plan and profile information to ensure that wildlife circulation in this area will be unimpeded by the HST construction and operation. The Conservancy also requested assistance in removing barriers to wildlife movement created by SR 58 as conditions of granting the Authority an easement through the conservation area. The Tejon Ranch Conservancy expressed interest in sharing biological resource information gathered by Tejon Ranch and by the Authority in this area.

- **Loop Ranch**

Loop Ranch manages an extensive cattle operation east of Keene on land that the HST alignment traverses. The Ranch also intends to develop land north of the City of Tehachapi for residential development. The Loop Ranch manager was particularly concerned about the alignment relative to ranch facilities, such as cattle pens and feedlots, which are the backbone of the cattle operation. The current plans/profiles appear to indicate the HST alignment travels at-grade near these facilities, potentially displacing them or creating a barrier to cattle operation. The Loop Ranch manager requested review of detailed plans/profiles to better understand potential impacts on ranch facilities and operations.

- **University of Antelope Valley**

The University of Antelope Valley ("University") is a private university located in refurbished buildings along Sierra Highway in Lancaster. One HST alternative (AV4 Option) traverses the campus parking area. The University director expressed concern that an at-grade alternative would block the principal access to the University from Sierra Highway, generate noise that would disrupt classroom activities, and jeopardize the safety of the students walking and driving in the parking area. In addition, the overall campus plan and long-range vision for expansion may be in conflict with the AV4 Option right-of-way requirements. The University, which the City of Lancaster considers an important community resource, supports the HST project and has requested working with the Authority to develop solutions that allow HST to traverse Lancaster without disrupting current activities or future campus planning initiatives.

- **Plant 42 and Defense Contractors**

The U.S. Air Force operates the Plant 42 airfield and manages defense contractor activities located on the eastern side of the UPRR south of Avenue M in Palmdale. Tie-in alignments connecting the alternatives traversing Antelope Valley with the two possible station locations in Palmdale pass by these facilities. The Air Force staff emphasized that the HST alignment profile cannot be elevated into the Plant 42 airfield flight restriction zone, and for the westernmost tie-in alignment, an easement from the Air Force would have to be formalized if construction were to occur on Air Force land across from Plant 42, on the western side of Sierra Highway. Unrelated to the stations, Air Force staff has stated that the HST cannot constrain emergency access at Avenue N, or future expansion of Avenue M. Defense contractors were concerned about the visibility of plant activities from elevated roads or HST facilities, and requested the HST's vibration effect on sensitive activities being conducted at Plant 42 be studied.

- **Los Angeles Department of Water and Power (LADWP)**

LADWP owns and operates a transmission line corridor and aqueduct near Mojave that all HST alternatives in this area would cross. LADWP expressed concern regarding the elevation of the catenary wire relative to the height of the transmission lines and the footings of HST piers across the aqueduct. In addition, each corridor contains maintenance roads and access points that need to be maintained, per LADWP. Conflicts with any of these facilities would have to be resolved during the HST project's environmental review phase.

- **Sempra and Southern California Edison**

Sempra and Southern California Edison (SCE) are major utilities that provide gas and electricity throughout the Bakersfield to Palmdale Section. Sempra expressed concern that large gas pipelines forming the backbone of their gas network cross under HST alignments at several points near Mojave, in Rosamond, and in Lancaster. The size and pressure of these pipelines would warrant special care during the construction phase to protect, and if need be, relocate the pipelines. In addition, an at-grade alignment could obstruct maintenance access to the infrastructure. SCE has major transmission lines and substations along the HST alignments. SCE expressed concern that the HST catenary could conflict with their overhead transmission lines in East Bakersfield and Mojave, and be near major substations that will receive power from alternative energy projects being developed in Kern County. SCE also indicated that the company would like to understand the power requirements that HST would demand from SCE, and have sufficient time to determine the effect of this demand on its existing system.

- **Caltrans**

HST alternatives parallel or cross SR 58 and SR 14 at several locations throughout the Bakersfield-Palmdale Section. The E2 alternative in the Edison subsection directly affects three SR 58 interchanges and two overpasses between Edison Road and Tower Line Road. Caltrans expressed concern that an at-grade or sub-grade profile through these SR 58 facilities could restrict or preclude future interchange and overpass improvements. In addition, Caltrans indicated that by closely paralleling the SR 58 right-of-way on the north, the HST could constrain roadway capacity projects in this area. Although Caltrans would prefer to have the alignment paralleling SR 58 placed farther away to avoid these potential conflicts, staff suggested that more detailed engineering work and information sharing would facilitate discussions to resolve these issues, and to determine the optimal plan and profile for the E2 alignment paralleling SR 58.

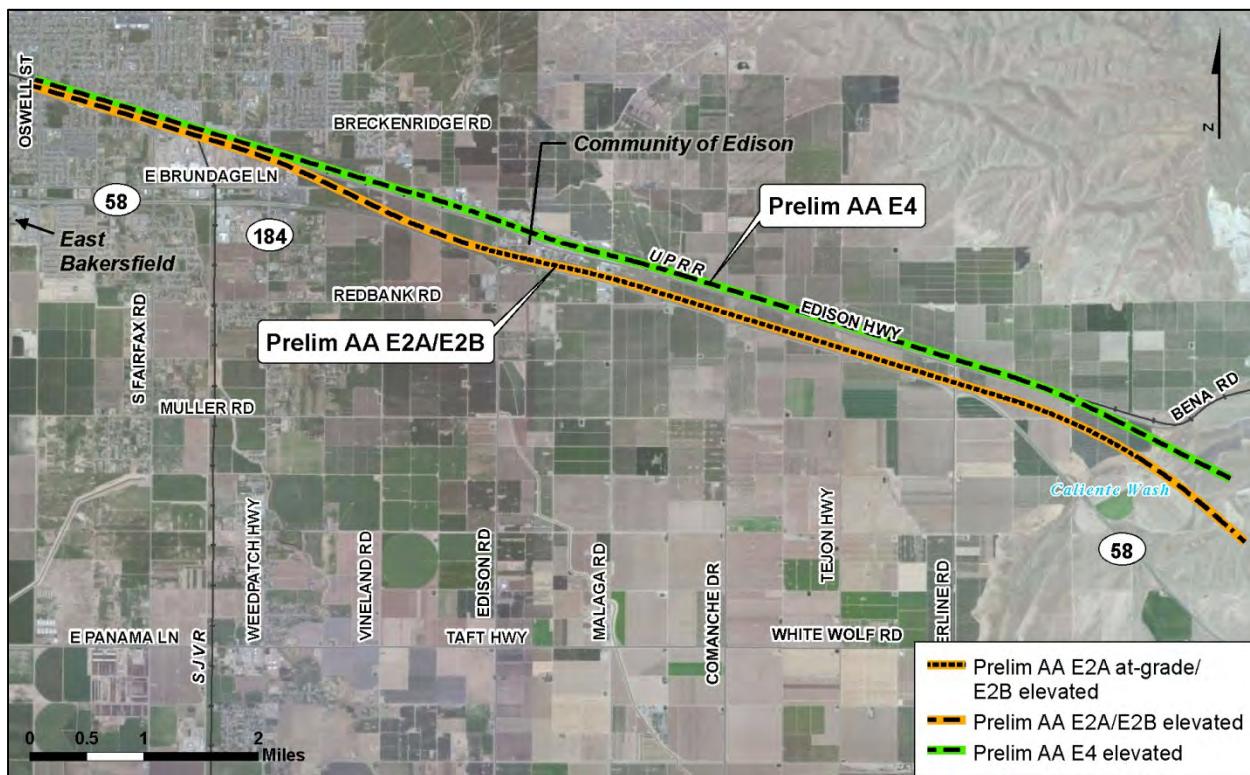
Because of refinements to the engineering design criteria, the Authority's intent to reduce project costs, and community input received, the following changes to the Preliminary AA alternatives were made for the Edison, Tehachapi, and Antelope Valley subsections.

Edison Subsection

Figure 1.2-1 provides an aerial map that illustrates the Edison Subsection alternatives carried forward in the Preliminary AA Report.

The Authority re-examined the Edison Subsection alternatives for cost-effective opportunities, including new profile design options for the Preliminary AA alternatives from Oswell Street in East Bakersfield to Caliente Creek, and a reduced construction footprint at affected SR 58 interchanges and overpasses. These alignment options generally mirror the same horizontal alignments as their respective Preliminary AA alternatives, but have different vertical profiles. The new profiles would result in impacts to the SR 58 overcrossings and interchanges, roadway configuration, intersections along Edison Highway, and earthwork footprints in areas where the HST alignment would be placed in a shallow cut.

Figure 1.2-1. Preliminary AA Alternatives: Edison Subsection



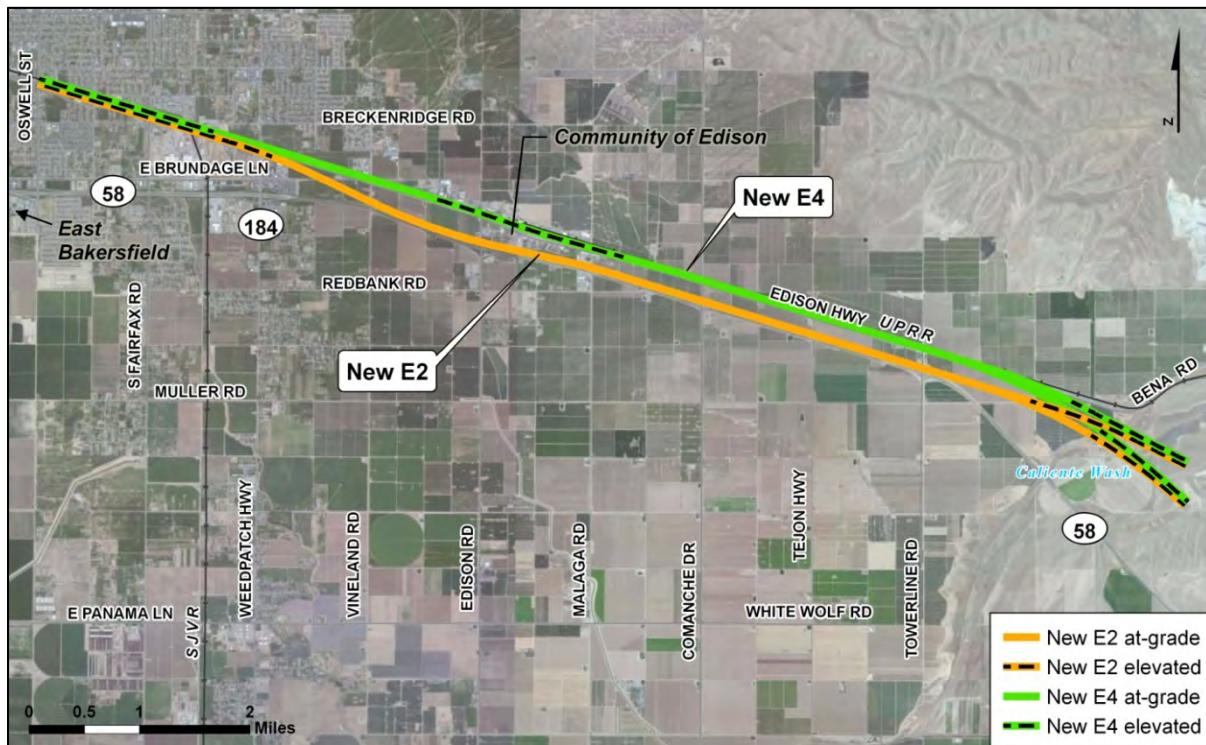
The revisions to the Preliminary AA E2A/2B and Preliminary AA E4 alternatives, referred to as New E2 and New E4, respectively, are illustrated on Figure 1.2-2. The revisions show a greater extent of at-grade alignment (solid line) for New E2 and New E4 compared with the Preliminary AA alternatives. A more detailed description of the New E2 and New E4 alignments and a comparison of the Preliminary AA alternatives with the New E2 and New E4 alignment options are presented below. A recommendation concerning which of these alternatives to carry forward is also provided. The recommendation is based on the evaluation of Table A-1 in Appendix A, Volume 2. The key factors that distinguish between the alternatives are highlighted (in yellow) in Table A-1. These evaluation results provide the supporting documentation for the recommendation on which alternatives should be carried forward.

As noted in the Preliminary AA, the Edison Subsection consists mainly of industrial and rural residential areas in the western part of the subsection, transitioning to mainly agricultural land uses south of the community of Edison. The alternatives selected to be carried forward in this Supplemental AA will continue to be refined to minimize impacts to land uses and surrounding communities.

New E2 is a primarily at-grade modification of the Preliminary AA E2A (SR 58 Adjacent North Side – Partially At-Grade Option) and Preliminary AA E2B (SR 58 Adjacent North Side – All Elevated Option) alternatives. The plan and profile of New E2 are depicted on Drawings C1001 through C1010 in Appendix C, Volume 2. Table 1.2-1 provides a comparison of the current Edison alternatives.

Description: The New E2 would continue on elevated structure from East Bakersfield along the western side of Edison Highway, crossing over the UPRR Spur #2 and Weedpatch Highway. Instead of continuing on elevated structure, as previously designed, New E2 would descend to grade near East Brundage Lane, severing several access points to commercial properties along East Brundage Lane, which would be reconfigured into a cul-de-sac. Vineland Road would be reconstructed to overcross the HST tracks.

Figure 1.2-2. New Edison Subsection Alignment Options



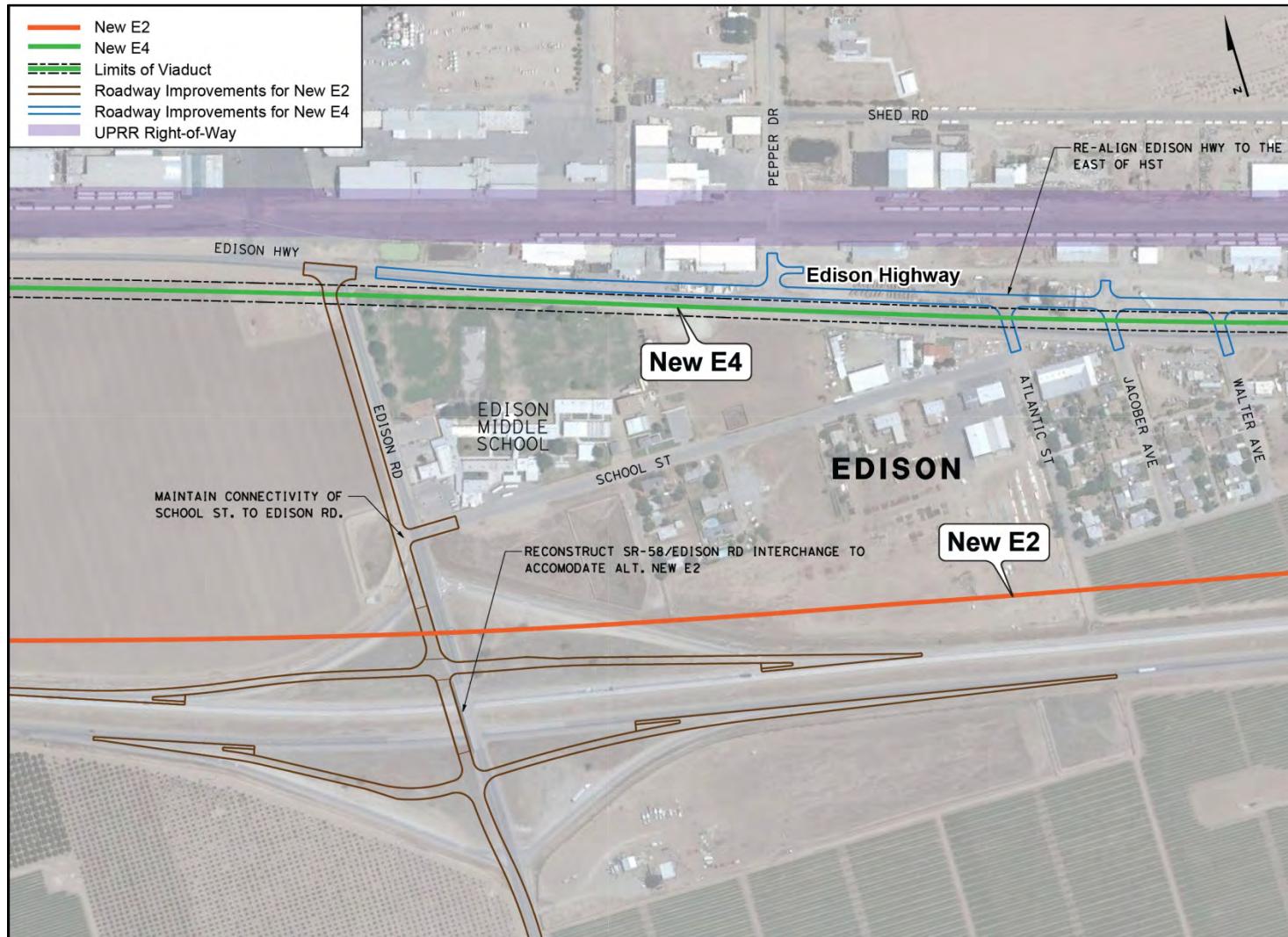
New E2 would be placed in a shallow cut that extends from East Brundage Lane parallel to the northern side of SR 58 to just past Tower Line Road (see Appendix C, Drawings C3000 to C3002, Volume 2). The sub-grade profile of New E2 would reduce the extent of the SR 58 interchange and overpass reconstruction required for the Preliminary AA E2A, and substantially decrease the cost compared to the all-elevated Preliminary AA E2B. Within the community of Edison, New E2 would require reconstructing the Edison Road overpass of SR 58 and relocating the existing westbound SR 58/Edison Road interchange ramps closer to the SR 58 roadway. Reconstructing the Edison Road overpass would create a slightly raised and realigned Edison Road as the HST alignment travels north toward Edison Highway. To maintain the connectivity of School Street with Edison Road and to facilitate access to Edison Middle School, School Street would be raised slightly to meet the realigned Edison Road at-grade (Figure 1.2-3). New E2 would traverse agricultural parcels just north of SR 58 and extend from Edison Road to Tower Line Road. At the SR 58/Comanche Drive interchange, reconstruction of Comanche Drive over New E2 would move the interchange ramp configuration closer to the SR 58 roadway, and require retaining walls for the northbound SR 58 ramps. Similarly, the interchange reconstruction of Tower Line Road over New E2 would move the interchange ramp configuration closer to the SR 58 roadway, and require retaining walls for the northbound SR 58 ramps. Once New E2 is east of Tower Line Road, the alignment would transition to an elevated profile traveling on viaduct to the Tehachapi subsection alignments. Overall, New E2 would travel at-grade for approximately 8 miles, reducing the length of elevated structure by 50% compared to the Preliminary AA alternatives, and lowering the viaduct height over Caliente Creek.

Evaluation: The Preliminary AA report recommended two options for this alternative to be carried forward. One option (Preliminary AA E2B) would minimize agricultural impacts and reconstruction of SR 58 interchanges by remaining on elevated structure the entire length of this subsection. A second option (Preliminary AA E2A) would combine elevated and at-grade profiles to reduce construction costs

Table 1.2-1. Characteristics of Edison Subsection Alternatives

Characteristics	Preliminary AA E2A (Partially At-Grade)	Preliminary AA E2B (All Elevated)	New E2 (At-Grade) Proposed Modification to E2 Profile	Preliminary AA E4 (All Elevated)	New E4 (At-Grade) Proposed Modification to E4 Profile
Subsection Alignment Length (in miles)	<ul style="list-style-type: none"> Alignment Length: 11.2 	<ul style="list-style-type: none"> Alignment Length: 11.2 	<ul style="list-style-type: none"> Alignment Length: 11.2 	<ul style="list-style-type: none"> Alignment Length: 11.2 	<ul style="list-style-type: none"> Alignment Length: 11.2
Profile Considerations (Length in miles)	<ul style="list-style-type: none"> Elevated structures: 5.0 At-grade: 6.2 Tunnel: 0 	<ul style="list-style-type: none"> Elevated structures: 11.2 At-grade: 0 Tunnel: 0 	<ul style="list-style-type: none"> Elevated structures: 3.3 At-grade: 7.9 Tunnel: 0 	<ul style="list-style-type: none"> Elevated structures: 11.2 At-grade: 0 Tunnel: 0 	<ul style="list-style-type: none"> Elevated structures: 4.8 At-grade: 6.4 Tunnel: 0
Number of Tunneled and Elevated Sections	<ul style="list-style-type: none"> Tunneled sections: 0 Elevated sections: 2 	<ul style="list-style-type: none"> Tunneled sections: 0 Elevated sections: 1 	<ul style="list-style-type: none"> Tunneled sections: 0 Elevated sections: 2 	<ul style="list-style-type: none"> Tunneled sections: 0 Elevated sections: 1 	<ul style="list-style-type: none"> Tunneled sections: 0 Elevated sections: 3
Height of Highest Elevated Structure	<ul style="list-style-type: none"> 200 feet ± (Caliente Creek) 	<ul style="list-style-type: none"> 200 feet ± (Caliente Creek) 	<ul style="list-style-type: none"> 150 feet ± (Caliente Creek) 	<ul style="list-style-type: none"> 200 feet ± (Caliente Creek) 	<ul style="list-style-type: none"> 150 feet ± (Caliente Creek)
Grade	<ul style="list-style-type: none"> Average grades generally under 1.5% (Oswell Street to Tower Line Road) Tehachapi subsection tie-in options (Tower Line Road to Caliente Creek) average grades vary from 1% to 2.5% 				
Number of Railroad Crossings	<ul style="list-style-type: none"> 0 railroad crossings 1 spur crossing 	<ul style="list-style-type: none"> 0 railroad crossings 1 spur crossing 	<ul style="list-style-type: none"> 0 railroad crossings 1 spur crossing 	<ul style="list-style-type: none"> 0 railroad crossings 1 spur crossing 	<ul style="list-style-type: none"> 0 railroad crossings 1 spur crossing
Number of New Grade Separations	<ul style="list-style-type: none"> 5 new grade separations 	<ul style="list-style-type: none"> 0 new grade separations 	<ul style="list-style-type: none"> 6 new grade separations 	<ul style="list-style-type: none"> 0 new grade separations 	<ul style="list-style-type: none"> 5 new grade separations

Figure 1.2-3. Edison Vicinity Alignment Options



relative to Preliminary AA E2B. After these Preliminary AA alternatives were approved to carry forward, the project team was directed to find additional cost savings for Preliminary AA E2A. The New E2 reduces the elevated section of Preliminary AA E2A by 1.7 miles, as indicated in Table 1.2-1. New E2 alignment could be located farther away from SR 58 than in the Preliminary AA E2A, and placed in a shallow cut, limiting the reconstruction of ramps and overpasses to the northern portion of the interchange (rather than the entire interchange, as with Preliminary AA E2A). As indicated in Table A-1 in Appendix A, Volume 2, compared with Preliminary AA E2A, New E2 decreases capital and maintenance costs due the elevated structure length being reduced, while displacing similar acreages of agricultural land and other uses. New E2 has similar, but fewer, potential environmental impacts than Preliminary AA E2A, and potentially still meets project objectives and purpose and need. For these reasons, **New E2 should be studied further**, and **Preliminary AA E2A should be dropped from further consideration**.

New E2 also would have a cost advantage over Preliminary AA E2B. As indicated in Table A-1 in Appendix A (Volume 2), the primarily at-grade alignment results in capital cost savings and avoids visual impacts compared to the Preliminary AA E2B all-elevated alignment. However, the all-elevated Preliminary AA E2B alignment would have a smaller disturbance footprint and, therefore, a reduced impact on SR 58 compared to New E2. Caltrans wanted assurance that the HST alignment traversing SR 58 interchange rampwork would not preclude future capacity and design improvements to these interchanges. Agricultural stakeholders requested that either alternative minimize potential effects on underground water conveyance systems and on drainage in the area. **It is recommended that New E2 be carried forward, along with Preliminary AA E2B. Essentially, these are the same horizontal location—one all elevated; one all at-grade. The optimal vertical alignment will be some combination of these two, with the majority of the alignment at-grade, to be developed during 15% design, using input from Caltrans and other key stakeholders. It will be described and included in the Draft EIR/S as part of a fully evaluated alternative/option.**

New E4 is a modification of the Preliminary AA E4 (Along Edison Highway – All Elevated). The plan and profile of New E4 are depicted on Drawings C1001 through C1010 in Appendix C, Volume 2.

Description: Like Preliminary AA E4, New E4 would originate at Oswell Street in East Bakersfield, continue on elevated structure along Edison Highway, and cross over the UPRR Spur #2 south of Fairfax Road. Near East Brundage Lane, instead of remaining elevated as in Preliminary AA E4, New E4 would descend to grade, severing East Brundage Lane. Weedpatch Highway would be reconfigured as an underpass to accommodate the at-grade profile of New E4, and the Vineland Road overcrossing would be reconstructed to maintain commercial access to businesses along Edison Highway.

To minimize circulation and access impacts in the community of Edison, New E4 would become elevated north of Edison Road; and as with the Preliminary AA E4, travel on elevated structure from Edison Road to Malaga Road, requiring a realignment of Edison Highway to the east of the HST alignment. For both E4 alignment options, the Edison Highway realignment would encroach onto the edge of Edison Middle School property, adjacent to Edison Highway, and affect four packing and shipping facilities that currently accommodate large vehicles (i.e., affect the access of tractor-trailers to truck bays) along Edison Highway (Figure 1.2-3). There may not be enough space remaining between the realigned Edison Highway and the existing trucking bays for truck-turning movements, potentially hindering business operations of several major packing and shipping facilities on the eastern side of Edison Highway. Pier placement for the elevated structure would need to allow sufficient area for turning and back-up movements for trucks accessing the loading docks, without obstructing drivers' views. South of Malaga Road, where Preliminary AA E4 would remain elevated along the southern side of Edison Highway, New E4 would transition from an elevated profile to an at-grade profile and continue in a shallow cut from Comanche Drive to just past Tower Line Road (see Drawings C3000 to C3002 in Appendix C, Volume 2). Placing New E4 in a shallow cut (approximately 15 feet deep) would sever access to Edison Highway on the west, requiring new overcrossings and connector roads that link the overcrossings with Edison Highway on the east. The connector roads would require new grade crossings of the UPRR and CPUC authorization. Once South of

Tower Line Road, the New E4 alignment would transition to an elevated profile and cross Caliente Creek on a viaduct before joining the Tehachapi Subsection alignments. Overall, New E4 would travel at-grade for approximately 6.4 miles, whereas Preliminary AA E4 would remain elevated for 11.2 miles (refer to Table 1.2-1).

Evaluation: The Preliminary AA report recommended that Preliminary AA E4, an all-elevated alternative, be carried forward and compared with E2 in the environmental document. After these Preliminary AA alternatives were approved to carry forward, the project team was directed to find additional cost savings for the all-elevated Preliminary AA E4. The team developed a design modification (New E4) that reduced the elevated alignment by over 6 miles, as indicated in Table 1.2-1. The lowered profile offers capital and maintenance cost reductions, while displacing similar acreages of agricultural land and other uses (Table A-1 in Appendix A, Volume 2). New E4 would also reduce the number of sensitive noise receptors affected, and the visual intrusion resulting from the Preliminary AA E4 continuous elevated structure. However, by being at-grade north and south of the community of Edison, New E4 would sever access to Edison Highway from the west at Weedpatch Highway, Comanche Road, Tejon Highway, and Tower Line Road. The severed connections would require constructing multiple grade separations of the at-grade HST alignment, impeding access to adjacent land uses. To maintain the connection of these major north-south arterials with Edison Highway and adjacent land uses, elevated intersections of the arterials with Edison Highway or new connector roads that must cross the UPRR at-grade would need to be constructed. The newly created UPRR grade crossings would be contrary to the Kern County and CPUC vehicular and railroad safety policies, and could result in project delays to negotiate an agreement with the UPRR. If this alternative were carried forward, Kern County Planning staff requested that additional analyses be conducted on ways to provide access to Edison Highway from north-south arterials grade-separated over the HST alignment, and avoid creating new UPRR grade crossings.

Through Edison, which is an Environmental Justice community, both E4 options are elevated, creating truck circulation and access impacts on the agricultural businesses that line Edison Highway (refer to Figure 1.2-3). Agricultural interests were skeptical that an elevated alignment could be designed to avoid hindering truck circulation along Edison Highway. The effects on truck circulation could create safety hazards for drivers and interfere with truck movements at loading docks for shipping and packing facilities. Stakeholders also expressed concern that under both alignment options, realigning Edison Highway through the community of Edison could reduce access to public facilities on the western side of the highway; also, stakeholders expressed concern that the elevated HST structure along the perimeter of Edison Middle School would pose a safety hazard to students.

Because Preliminary AA E4 and New E4 profile options have raised concerns among stakeholders that could make E4 controversial and undesirable, it is recommended that further study of the E4 plan and profile—both Preliminary AA E4 and New E4—be conducted. Essentially, these are the same horizontal location—one all elevated; one primarily at-grade. The optimal vertical alignment will be some combination of these two, with the majority of the alignment at-grade, developed during 15% design. E4 will be described and included in the Draft EIR/S as part of a fully evaluated alternative/option. It will be developed in close coordination with Kern County, agricultural businesses, and the Edison School District to determine if the safety, circulation, and access issues discussed above can be resolved.

Tehachapi Subsection

Figure 1.3-1 illustrates the Tehachapi Subsection alternatives carried forward in the Preliminary AA Report.

After the Authority Board approval to carry forward four alternatives in the Tehachapi Subsection, the Authority conducted studies to examine the need to place traction power phase breaks (a short, electrically unpowered segment of track that is required on electrified railways that draw traction power

from different power grids of varying voltages and frequencies) only on relatively flat terrain, a need that is reflected in two of the four alternative alignments that are referred to as "B" alternatives on Figure 1.3-1. After further study, the Authority agreed that phase breaks could be placed in open areas that contained acceptable grades. **As a result, the "B" alternatives that incorporated a phase break on flat terrain should be dropped from further study.**

The Authority then re-examined the remaining Tehachapi alternatives for cost-effective opportunities to reduce the overall alignment length and the length of elevated structures and tunnels. Alternative New T3 was developed and compared with the Preliminary AA T3-1 and Preliminary AA T3-2 alternatives. The alternatives are depicted on Figure 1.3-2, and New T3 is described below. The Preliminary AA alternatives are compared with New T3, and a recommendation of those to be carried forward is presented below, based on the evaluation information in Table A-2 in Appendix A (Volume 2). Key factors that distinguish among the alternatives are highlighted (in yellow) in Table A-2, and these evaluation results support the recommendation of which alternatives should be carried forward.

New T3 is a new alternative that is modified to follow the Preliminary AA T3-1 horizontal alignment at steeper grades through the Tehachapis and to provide a more direct route through the Mojave area. The plan and profile of this alternative are depicted on Drawings C1011 through C1015 in Appendix C, Volume 2.

Description:

Tehachapi Incline Section

New T3 follows the Preliminary AA T3-1 alignment between Caliente Creek and the City of Tehachapi at a steeper average gradient than previously allowed under Authority design standards. New T3 reflects the variance in gradient standards by increasing the average grade (up slope) to 2.85% over 19.5 miles, with a maximum sustained grade of 3.30% over 8 miles (near Keene to the summit)⁷. As indicated on Figure 1.3-3, the New T3 profile through the Tehachapis, differs from Preliminary AA T3-1 and Preliminary AA T3-2. The increased grades allow the use of either at-grade or cuts and fill. This reduces the length and height of elevated structures and the length of tunnels, and offers cost savings compared with the Preliminary AA T3-1 and Preliminary AA T3-2 alternatives.

Table 1.3-1 provides a comparison of the Tehachapi alternatives. This comparative analysis indicates that the length of elevated structures with New T3 is reduced by nearly 5 miles compared with Preliminary AA T3-1, and nearly 8 miles compared with Preliminary AA T3-2. New T3 also lowers the maximum height of the elevated structures to 185 feet from 330 feet (T3-2) and it shortens the alignment in this subsection by approximately 1 mile.

⁷ The variance in gradient criteria was discussed with the PMT and Authority in September 2010. The documentation to support a design variance will be required during the 15% design process.

Figure 1.3-1. Preliminary AA Alternatives: Tehachapi Subsection

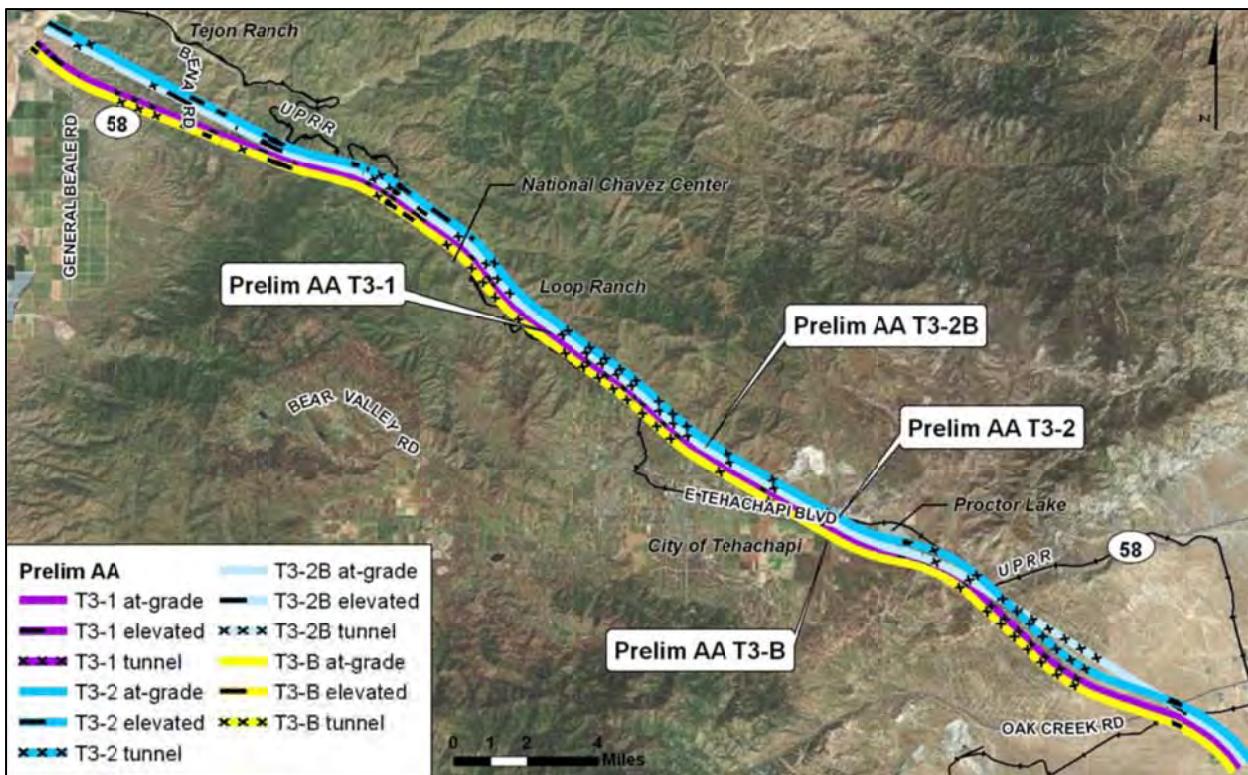


Figure 1.3-2. Tehachapi Subsection Alternatives Considered and Evaluated

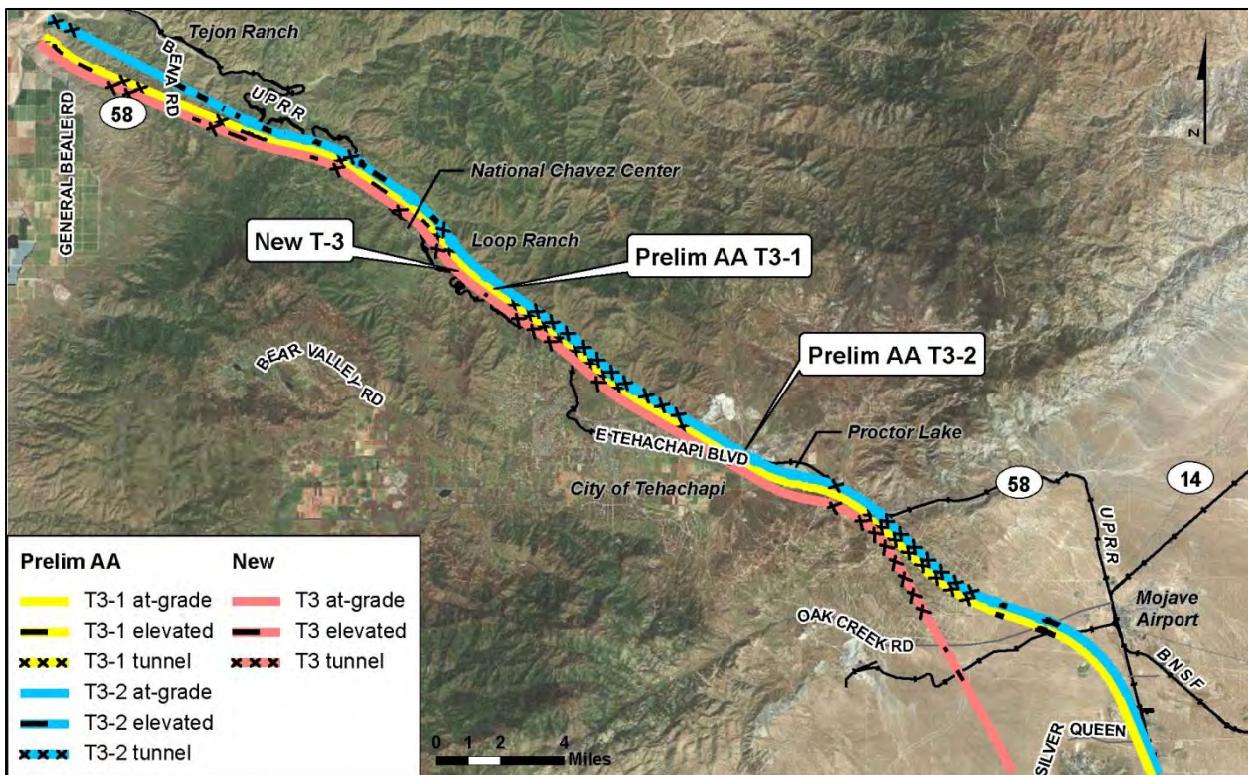


Figure 1.3-3. Tehachapi Subsection Alternatives: Incline Profile

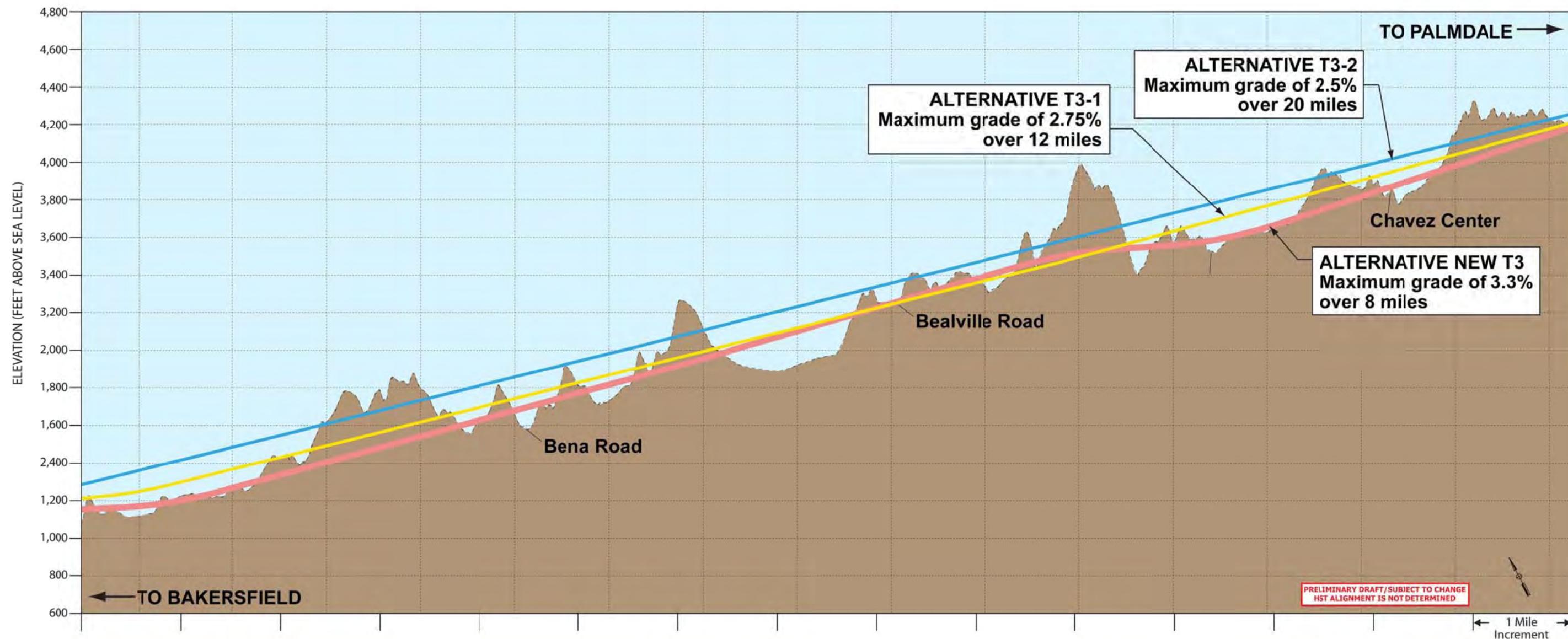


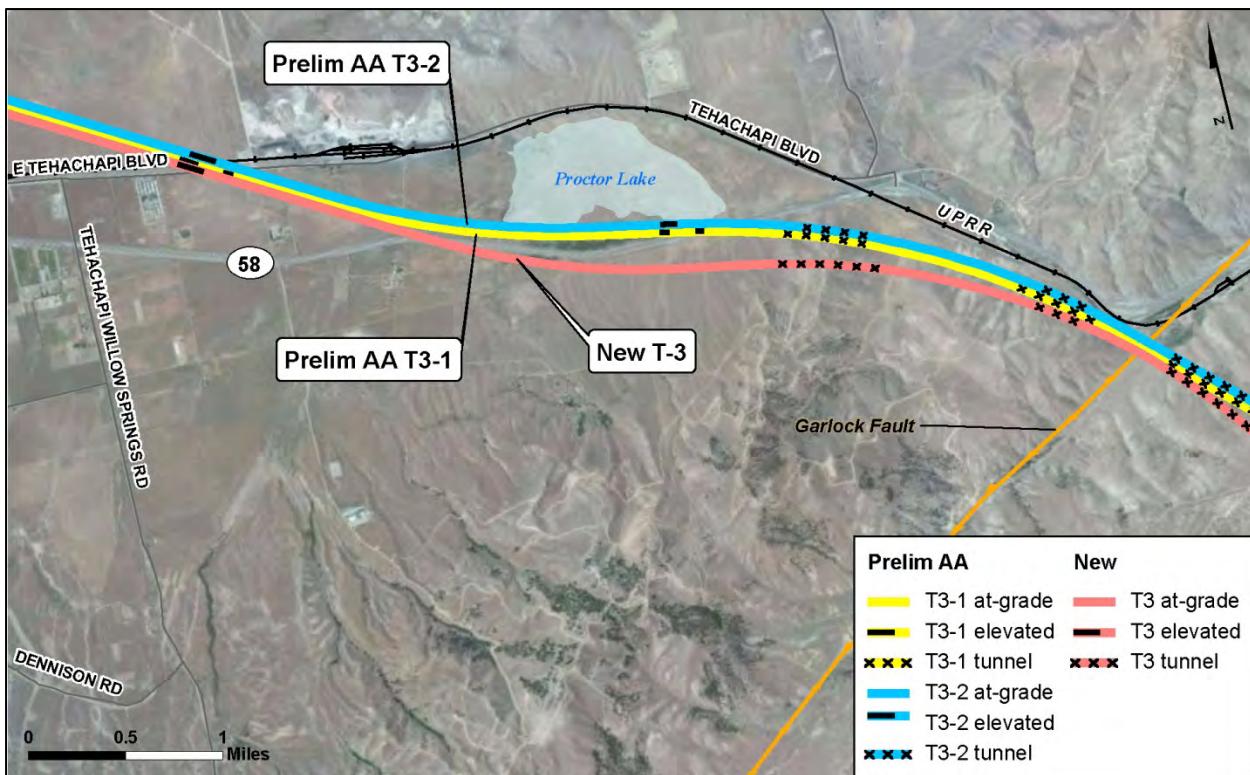
Table 1.3-1. Characteristics of Tehachapi Subsection Alternatives

Characteristics	New Alternative T3	Preliminary AA T3-1	Preliminary AA T3-2
Subsection Alignment Length (in miles)	<ul style="list-style-type: none"> Alignment Length: 39.4 	<ul style="list-style-type: none"> Alignment Length: 40.4 	<ul style="list-style-type: none"> Alignment Length: 40.5
Profile Considerations (length in miles)	<ul style="list-style-type: none"> Cut/Fill/At-grade: 25.2 Elevated structures: 3.4 Tunnel: 10.9 	<ul style="list-style-type: none"> Cut/Fill/At-grade: 19.5 Elevated structures: 8.0 Tunnel: 12.8 	<ul style="list-style-type: none"> Cut/Fill/At-grade: 19.2 Elevated structures: 11.0 Tunnel: 10.3
Number of Tunneled and Elevated Sections	<ul style="list-style-type: none"> Tunneled sections: 13 Elevated sections: 11 	<ul style="list-style-type: none"> Tunneled sections: 10 Elevated sections: 13 	<ul style="list-style-type: none"> Tunneled sections: 13 Elevated sections: 13
Height of Highest Elevated Structure	<ul style="list-style-type: none"> 185 feet ± 	<ul style="list-style-type: none"> 205 feet ± 	<ul style="list-style-type: none"> 330 feet ±
Grade	<ul style="list-style-type: none"> Average grade of 2.85% over 20 miles Sustained grade of 3.3% over 8 miles Maximum grade of 3.3% over 8 miles 	<ul style="list-style-type: none"> Average grade of 2.65% over 20 miles Sustained grade of 2.75% over 12 miles Maximum grade of 2.75% over 12 miles 	<ul style="list-style-type: none"> Average grade of 2.5% over 20 miles Sustained grade of 2.5% over 20 miles Maximum grade of 2.5% over 20 miles
Number of Railroad Crossings	<ul style="list-style-type: none"> 2 UPRR crossings 	<ul style="list-style-type: none"> 2 UPRR crossings 	<ul style="list-style-type: none"> 2 UPRR crossings
Number of New Grade Separations	<ul style="list-style-type: none"> 3 new grade separations 	<ul style="list-style-type: none"> 4 new grade separations 	<ul style="list-style-type: none"> 3 new grade separations

Proctor Lake Area

North of the City of Tehachapi, New T3 traverses a planned development area with a similar alignment and sub-grade profile as Preliminary AA T3-1 (refer to Drawing C3005, Section E-E in Appendix C, Volume 2). To the east at Proctor Lake, New T3 diverts from the two Preliminary AA alignments, which share an alignment passing through Proctor Lake, a seasonal wetland (Figure 1.3-4).

Figure 1.3-4. Tehachapi Subsection Alternatives in Proctor Lake Vicinity

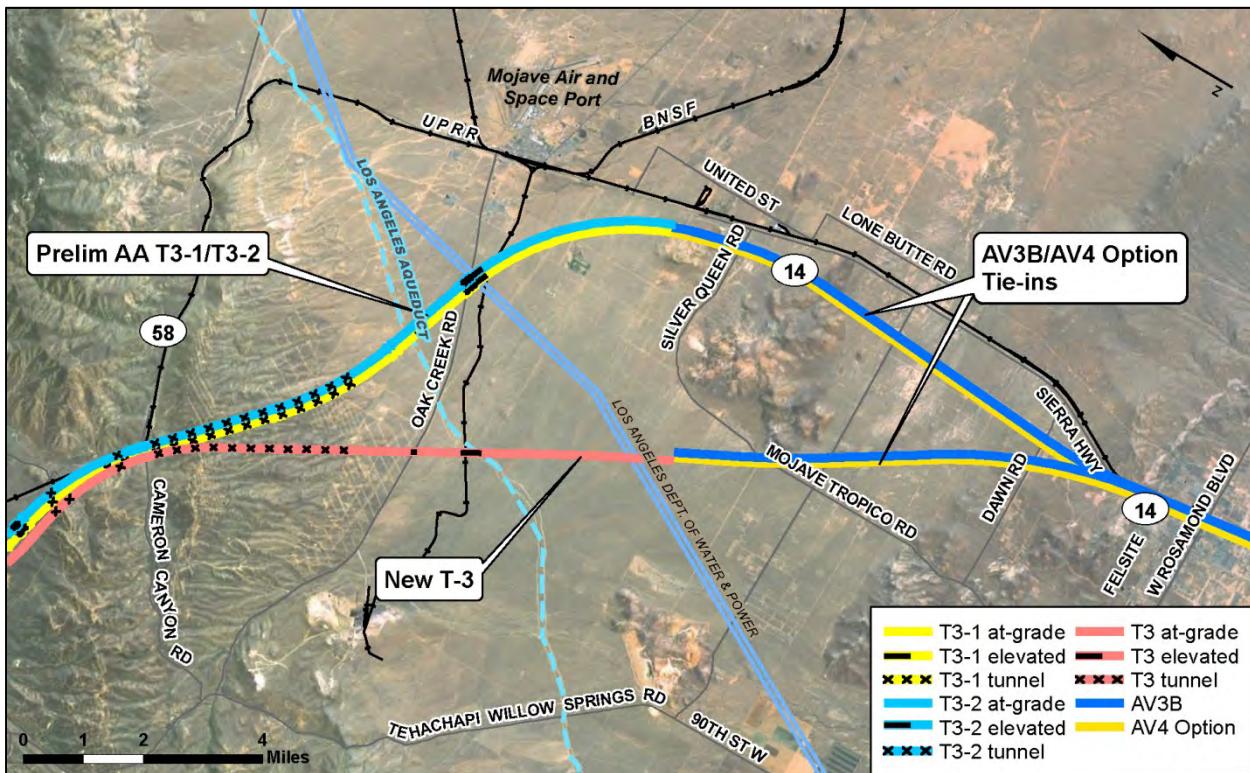


Mojave Area

East of Proctor Lake, New T3 tunnels through the easternmost Tehachapi ridge and follows a more direct, southerly route through the Mojave to Rosamond than the Preliminary AA T3-1 and Preliminary AA T3-2 alternatives, reducing the overall alignment length between Cameron Canyon Road and Rosamond (Felsite Avenue) by over 1.5 miles (see Figure 1.3-5). Although none of the alternatives directly traverse Mojave Air and Space Port, New T3 is further away and does not infringe on the County's restrictive development envelope surrounding the airport, or require FAA authorization. A comparison of the alternatives traversing the Mojave area is provided in Table 1.3-2. The table indicates that New T3 has less cut, fill, tunnel, and elevated structure than Preliminary AA T3-1/Preliminary AA T3-2, which have the same plan and profile in this area.

Evaluation: As indicated above, the Preliminary AA report recommended that Preliminary AA T3-1 and Preliminary AA T3-2 be carried forward in the environmental document. Following this approval, the team was directed to find additional cost savings compared to Preliminary AA T3-1 and Preliminary AA T3-2, which have extensive elevated and tunnel sections.

Figure 1.3-5. Tehachapi Subsection Alternatives in Mojave Vicinity



Tehachapi Incline Section between Caliente Creek and Proctor Lake

In summary, New T3 would reduce the elevated alignment length by more than 4 miles relative to Preliminary AA T3-1, and more than 7 miles relative to Preliminary AA T3-2 (refer to Table 1.3-1), while maintaining similar tunnel lengths. In addition to reducing elevated alignment length, New T3 could result in the height of elevated structures crossing deep valleys in the Tehachapi Mountains being reduced, producing additional cost savings. As indicated in Table A-1 in Appendix A, Volume 2, compared with Preliminary AA T3-1 and Preliminary T3-2, New T3 would result in decreased capital and maintenance costs and is easier to construct due to reducing the length and height of elevated structures, and the number and length of tunnels in the Tehachapi incline section between Caliente Creek and the City of Tehachapi. The alignment would also affect fewer sensitive noise receptors. By traveling at-grade or slightly below-grade throughout the incline section (Figure 1.3-3), New T3 would affect more threatened and endangered species habitat acres, and may require wildlife crossing features to maintain wildlife circulation, for which the Tejon Ranch Conservation Trust and the Nature Conservancy have expressed a concern. The at-grade alignment would also need to consider the Loop Ranch cattle operations.

It is recommended that New T3 and Preliminary AA T3-1 be carried forward. It is recommended that Preliminary AA T3-2 be carried forward, but modified to lower its vertical profile. The cost, constructability, and environmental issues of these three alternatives will then be compared further. The results of the additional study will be documented in the Draft EIR/S, either as part of one or more fully evaluated alternatives/options, or in the discussion of alternatives considered, but ultimately not carried forward for full EIR/S analysis.

Table 1.3-2. Characteristics of Mojave Area Alternatives

Characteristics	New T3 + AV Tie-in (Cameron Canyon Rd – Felsite Ave)	Preliminary AA T3-1/T3-2 + AV Tie-in (Cameron Canyon Rd – Felsite Ave)
Subsection Alignment Length (in miles)	<ul style="list-style-type: none"> Alignment Length: 17.4 	<ul style="list-style-type: none"> Alignment Length: 19.6
Profile Considerations = (length in miles)	<ul style="list-style-type: none"> Cut/Fill/At-grade: 13.6 Elevated structures: 0.5 Tunnel: 3.3 	<ul style="list-style-type: none"> Cut/Fill/At-grade: 15.2 Elevated structures: 0.8 Tunnel: 3.6
Number of Tunneled and Elevated Sections	<ul style="list-style-type: none"> Tunneled sections: 1 Elevated sections: 2 	<ul style="list-style-type: none"> Tunneled sections: 1 Elevated sections: 2
Height of Highest Elevated Structure	<ul style="list-style-type: none"> ±50 feet 	<ul style="list-style-type: none"> ±50 feet
Grade	<ul style="list-style-type: none"> Average grade of 2.04% over 8.0 miles Sustained grade of 0.52% over 2.5 miles Maximum grade of 2.41% over 2.0 miles 	<ul style="list-style-type: none"> Average grade of 2.57% over 8.0 miles Sustained grade of 0.00% over 3.5 miles Maximum grade of 3.20% over 3.0 miles
Number of Railroad Crossings	<ul style="list-style-type: none"> 0 Rail crossing 1 Spur crossing 	<ul style="list-style-type: none"> 0 Rail crossing 1 Spur crossing
Number of New Grade Separations	<ul style="list-style-type: none"> 5 new grade separations 	<ul style="list-style-type: none"> 5 new grade separations

Mojave Area between Cameron Canyon Road and Felsite Avenue in Rosamond

Between Proctor Lake and Rosamond, New T3 is a more direct southerly route compared with T3-1 and T3-2, which are closer to the Programmatic alignment. New T3 would avoid the potential land use restrictions and FAA authorization imposed by the proximity of the Preliminary AA T3-1 and Preliminary AA T3-2 alternatives to Mojave Airport, a concern expressed by Airport staff. New T3 may minimize the costs associated with crossing the Los Angeles Department of Water and Power transmission lines, which would need to be raised to accommodate the Preliminary AA T3-1 and Preliminary AA T3-2 elevated alignment in this area (Figure 1.3-5). As indicated in Table A-2A, Volume 2, New T3 would also avoid encroaching on three SR 14 interchanges (Silver Queen Road, Backus Road, and Dawn Road), and affect fewer major arterials than Preliminary AA T3-1 and Preliminary AA T3-2. In addition, New T3 would cross fewer wetland habitat acres and waterways, avoid crossing BLM land, and affect one-third as many sensitive noise receptors. All alternatives would affect alternative energy project development in the Mojave; however, New T3 would affect fewer wind project development areas and no solar projects compared with Preliminary AA T3-1 and Preliminary AA T3-2.

It is recommended that New T3 in the Mojave area be carried forward, and Preliminary AA T3-1 and Preliminary AA T3-2 be dropped, because New T3 is shorter, faster, less costly, and easier to construct. It also has reduced traffic circulation, wetland and waterway impacts, and resulted in fewer sensitive noise receptors along the alignment. It would conflict with fewer existing and planned wind turbines and solar farms. Unlike Preliminary AA T3-1 and Preliminary AA T3-2, New T3 would avoid traversing BLM land in the Mojave area, and generating land use and utility conflicts near Mojave Airport. New T3 has no greater

potential environmental impacts than Preliminary AA T3-1 and Preliminary AA T3-2, and potentially meets the project objectives and purpose and need.

Antelope Valley Subsection

Figure 1.4-1 illustrates the Antelope Valley Subsection alternatives carried forward in the Preliminary AA Report.

The Authority re-examined the Antelope Valley alternatives for cost-effective opportunities, including more at-grade configurations compared with the Preliminary AA alternatives in Rosamond and Lancaster, which were primarily elevated through these communities. Profile differences among the alignment alternatives generate differing impacts to roadway and intersection grade-separations; access to surrounding parcels; land-use displacement; and encroachment into Metrolink, UPRR, and bicycle lane rights-of-way.

The revisions to Preliminary AA AV3B and Preliminary AA AV4 Options, New AV3B and New AV4 Option, respectively, are illustrated on Figure 1.4-2. This figure shows the extent of at-grade alignment (solid line) for New AV3B and New AV4 Options compared with the Preliminary AA alternatives. The New AV3B and New AV4 Options alignment descriptions, and a comparison of the Preliminary AA and New AV3B and AV4 Option alignments, are presented below. Also, a recommendation of the alternatives to be carried forward is provided. The recommendation is based on the evaluation of alternatives that is summarized in Table A-3 in Appendix A, Volume 2. Key factors that distinguish among the alternatives are highlighted (in yellow) in Table A-3, and these evaluation results provide the supporting documentation for recommending which alternatives should be carried forward.

As noted in the Preliminary AA Report, in Rosamond and Lancaster, the HST alignment passes mainly through commercial and industrial land uses. The alternatives identified to be carried forward would continue being refined to minimize impacts to land uses, traffic circulation, and the surrounding community.

New AV3B is a modification of the Preliminary AA AV3B (between UPRR and Sierra Highway – Partially Elevated) that lowers the profile to grade throughout most of the alignment. The alignment option plan and profile are depicted on Drawings C1016 through C1025 in Appendix C, Volume 2.

Description: New AV3B would have a similar, if slightly shorter, alignment as the Preliminary AA AV3B between Purdy Avenue near Mojave and Avenue M in Lancaster. However, through the community of Rosamond and the City of Lancaster, New AV3B would travel at-grade. The at-grade alignment would reduce elevated structures from 7 miles to 0.5 mile, but require constructing roadway overcrossings or undercrossings at Rosamond Boulevard, Avenue A, and possibly Patterson Road in Rosamond; and Avenue I, Lancaster Boulevard, Avenue J, Avenue K and Avenue M in Lancaster.

At-grade construction typically requires an expanded right-of-way, which could result in realigning Sierra Highway 30 to 45 feet to the west of its current location in portions of Rosamond and Lancaster, resulting in additional acquisitions. Alternatively, New AV3B could be shifted slightly east to be located within the UPRR right-of-way, thereby maintaining the current alignment of Sierra Highway and avoiding displacing land uses on the west. This scenario would be contingent upon an agreement with UPRR to use their right-of-way. In either case, the at-grade HST profile would sever east-west arterials that are currently operating across the alignment at-grade. The Authority would construct grade separations at major arterials to ensure circulation between the eastern and western sections of the city would be maintained. Existing overpasses at Avenues H and L would be raised 10 feet to allow clearance for the HST overhead catenary. Access to Sierra Highway and adjacent land uses would be maintained by providing new connector roads or street-level connections within the existing public right-of-way.

As with the Preliminary AA AV3B, New AV3B would displace the current Lancaster Metrolink Station, which would be relocated immediately west along Sierra Highway, and businesses south of the station. Table 1.4-1 presents data comparing the Antelope Valley alternatives.

Figure 1.4-1. Preliminary AA Alternatives: Antelope Valley Subsection



Figure 1.4-2. New Antelope Valley Subsection Alignment Options



Table 1.4-1. Characteristics of Antelope Valley Subsection Alternatives

Characteristics	Preliminary AA AV3B (Partially Elevated)	New AV3B (Primarily At-Grade) Proposed Modification to AV3B Profile	Preliminary AA AV4 Option (Primarily Elevated)	New AV4 Option (Primarily At-Grade) Proposed Modification to AV4 Option Profile
Subsection Alignment Length (in miles)	<ul style="list-style-type: none"> Alignment Length: 25.6 	<ul style="list-style-type: none"> Alignment Length: 24.3 	<ul style="list-style-type: none"> Alignment Length: 25.5 	<ul style="list-style-type: none"> Alignment Length: 25.5
Profile Considerations (Length in miles)	<ul style="list-style-type: none"> Elevated structures: 7.0 At-grade: 18.6 Tunnel: 0 	<ul style="list-style-type: none"> Elevated structures: 0.5 At-grade: 23.8 Tunnel: 0 	<ul style="list-style-type: none"> Elevated structures: 7.7 At-grade: 17.8 Tunnel: 0 	<ul style="list-style-type: none"> Elevated structures: 0 At-grade: 25.5 Tunnel: 0
Number of Tunneled and Elevated Sections	<ul style="list-style-type: none"> Tunneled sections: 0 Elevated sections: 2 	<ul style="list-style-type: none"> Tunneled sections: 0 Elevated sections: 1 	<ul style="list-style-type: none"> Tunneled sections: 0 Elevated sections: 2 	<ul style="list-style-type: none"> Tunneled sections: 0 Elevated sections: 0
Height of Highest Elevated Structure	<ul style="list-style-type: none"> 30 feet 	<ul style="list-style-type: none"> 50 feet 	<ul style="list-style-type: none"> 60 feet 	<ul style="list-style-type: none"> 0 feet
Grade	<ul style="list-style-type: none"> Average grade of 0.75% over 7 miles Sustained grade of 0.0% over 11 miles Maximum grade of 1.5% over 3 miles 	<ul style="list-style-type: none"> Average grade of 0.75% over 4 miles Sustained grade of 0.0% over 11 miles Maximum grade of 1.8% over 3 miles 	<ul style="list-style-type: none"> Average grade of 0.75% over 8.0 miles Sustained grade of 0.0% over 11 miles Maximum grade of 1.0% over 3 miles 	<ul style="list-style-type: none"> Average grade of 0.75% over 4 miles Sustained grade of 0.0% over 11 miles Maximum grade of 1.0% over 2 miles
Number of Railroad Crossings	<ul style="list-style-type: none"> 0 railroad crossings 	<ul style="list-style-type: none"> 0 railroad crossings 	<ul style="list-style-type: none"> 0 railroad crossings 	<ul style="list-style-type: none"> 0 railroad crossings
Number of New Grade Separations	<ul style="list-style-type: none"> 11 new grade separations Sierra Highway would be relocated for approximately 11.0 miles between 45 feet and 85 feet to the west 	<ul style="list-style-type: none"> 16 new grade separations Sierra Highway would be relocated for approximately 12 miles between 48 feet (in Rosamond) and 75 feet (in Lancaster) to the west 	<ul style="list-style-type: none"> 10 new grade separations Sierra Highway would be relocated for approximately 1.4 miles 110 feet to the east 	<ul style="list-style-type: none"> 17 new grade separations Sierra Highway would be relocated for approximately 1.4 miles 110 feet to the east (all in Rosamond)

Evaluation: As indicated above, the Preliminary AA report recommended that AV3B, a hybrid at-grade/elevated alternative, be carried forward in the environmental document. After the Preliminary AA alternatives were approved, the project team was directed to find cost savings for this alternative. The project team modified Preliminary AA AV3B by reducing the elevated alignment, primarily through Rosamond and Lancaster, from 7 miles to 1/2 mile, thereby decreasing overall railway capital and maintenance costs (refer to Table 1.4-1 and Table A-3 in Appendix A, Volume 2).

Although decreased railway capital costs would result from New AV3B, this alternative would require more grade separations. In Rosamond, HST at-grade would require two or three grade separations; in Lancaster, five grade separations would be required. Rosamond and Lancaster affirmed the benefit of multiple grade separations over Sierra Highway and the UPRR, but were concerned about land and the property displacements required, and the location of new access roads to maintain the link between Sierra Highway and the east-west arterials. For example, New AV3B would require a grade separation at Lancaster Boulevard, which was recently redesigned to enhance the civic and commercial function of that street. A Lancaster Boulevard overcrossing of the HST tracks, Sierra Highway, and the UPRR right-of-way would extend several blocks east and west of Sierra Highway, displacing a portion of the redesigned street. An underpass would limit this disruption to one block of the redesigned street. Retaining the Lancaster Boulevard improvements is a key concern for the city. In addition, the city expressed concern that greater right-of-way width for an at-grade alignment would require realigning Sierra Highway west, necessitating partial takes of businesses fronting Sierra Highway, and disrupting circulation and parking at the University of Antelope Valley. Shifting the HST alignment into the UPRR right-of-way could avoid realigning Sierra Highway to the west, keeping the existing uses along Sierra Highway intact.

In contrast, Preliminary AA AV3B would minimize the realignment of Sierra Highway and reduce the need for property acquisitions by traversing Rosamond and Lancaster on elevated structures. In addition, Preliminary AA AV3B would pass over Avenues I, J, K, and M, Lancaster Boulevard, and Sierra Highway south of Avenue H, eliminating the need to grade separate these roadways, and construct connector roads to maintain access from the east-west arterials to Sierra Highway. Lancaster Boulevard would remain intact, and fewer properties would be displaced or have access affected, either temporarily for construction, or permanently lost (refer to Table A-3 in Appendix A, Volume 2).

For these reasons, it is recommended that both Preliminary AA AV3B and New AV3B be carried forward. Essentially, these are the same horizontal location—one all-elevated; and one containing at-grade sections. The optimal vertical alignment will be some combination of these two, with the majority at-grade. It will be developed with input from the City of Lancaster, the Rosamond Community Services District, and other key stakeholders, such as the University of Antelope Valley and the UPRR, to minimize access, circulation, and land use impacts that would result from the construction of this alternative. The optimal profile for this alternative would be developed during 15% design. The results of the additional study will be documented in a further AA, or in the Draft EIR/S, either as part of a fully evaluated alternative/option, or in the discussion of alternatives considered, but ultimately not carried forward for full EIR/S analysis.

New AV4 Alignment Option (“New AV4 Option”) is a modification of the Preliminary AA AV4 Option (Within or Adjacent to Sierra Highway, UPRR Avoidance Option – Partially Elevated) that lowers the profile to grade throughout the alignment between Purdy Avenue near Mojave and Avenue M in Lancaster. The plan and profile of this alignment option are depicted on Drawings C1016 through C1025 in Appendix C, Volume 2.

Description: As stated in the Preliminary AA Report, AV4 Option was developed as an alternative to avoid using the UPRR right-of-way, if an agreement with UPRR allowing HST to locate along or within the right-of-way could not be negotiated. New AV4 Option follows the same alignment as described in the Preliminary AA Report, but at a lowered profile to reduce construction costs. The resulting at-grade

profile would eliminate 7.7 miles of elevated structure, but would require constructing overcrossings or undercrossings at SR 14 north of Rosamond, Rosamond Boulevard, Avenue A, and possibly Patterson Road in Rosamond (refer to Table 1.4-1).

Grade separations of Avenues I, J, K, and M; Lancaster Boulevard, and Sierra Highway south of Avenue H, would be constructed in Lancaster. The overcrossings or undercrossings would require redesigning the intersections with Sierra Highway, which could be raised to the level of the overcrossing or redesigned with ramp connectors to Sierra Highway. Other east-west streets accessing Sierra Highway from the west, such as Avenue G-12 and Avenue K-8, would be severed. In addition, reconfiguring the existing Avenue H and Avenue L overcrossings to accommodate the HST catenary system would be required. The New AV4 Option at-grade alignment would sever access to and potentially displace businesses south of Avenue J, including severing access to the University of Antelope Valley from Sierra Highway. In addition, the newly redesigned Lancaster Boulevard west of Sierra Highway would be affected.

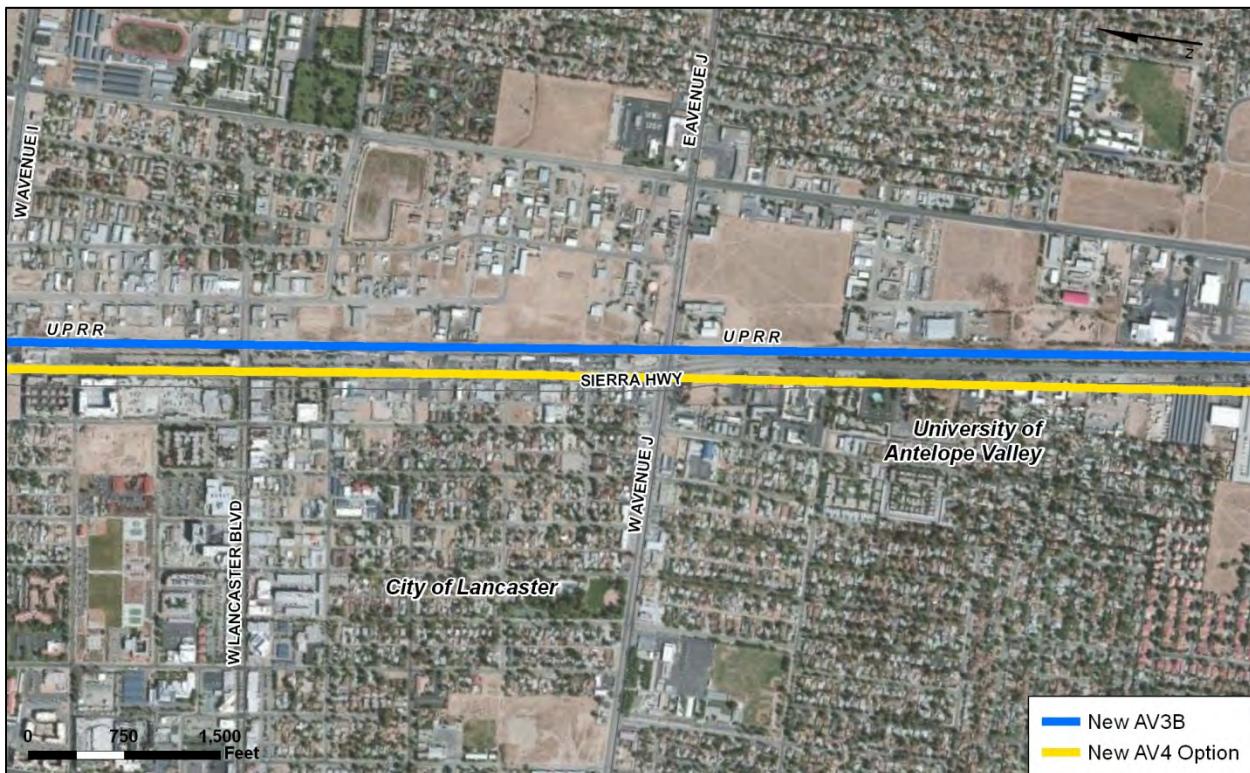
Evaluation: As indicated above, the Preliminary AA report recommended that Preliminary AA AV4 Option, a primarily elevated alternative through Rosamond and Lancaster, be carried forward in the environmental document. After the Preliminary AA alternatives were approved, the project team was directed to find cost savings for this alternative. The project team modified Preliminary AA AV4 Option by lowering the profile of more than 7 miles of elevated alignment, thereby decreasing overall capital and maintenance costs (refer to Table 1.4-1 and Table A-3 in Appendix A, Volume 2).

As indicated in Table A-3 in Appendix A, Volume 2, the relative ease of construction and decreased capital costs for New AV4 Option would be offset by increased right-of-way requirements that could extend into areas along Sierra Highway between Rosamond and Lancaster containing clay pans, which the Army Corps of Engineers considers valuable seasonal wetlands resources. Additional costs would be incurred by constructing multiple grade separations to allow HST to travel at-grade without severing major east-west arterials. As indicated above, the HST at-grade alignment would require two to three grade separations in Rosamond, and six grade separations, including Lancaster Boulevard, in Lancaster. The new grade separations would require constructing access ramps linking the east-west arterials with Sierra Highway to allow continued turning movements between Sierra Highway and these east-west arterials, and to maintain access to businesses near these intersections. In addition, New Option AV4 would generate access impacts and displace land uses on the western side of Sierra Highway between Avenue H and Avenue I, as well as south of Avenue J, including parking at the University of Antelope Valley and blocking the University's access from Sierra Highway (Figure 1.4-3). Traffic circulation and access issues would need to be addressed, and the design and schedule of roadway construction would need to be coordinated with the local jurisdictions.

Overall, the Rosamond Community Services District and City of Lancaster have expressed concerns about the effects of New AV4 Option on land use displacement, access, and circulation. These jurisdictions prefer that this alternative be eliminated. AV4 Option was developed as an avoidance alternative for intruding on the UPRR right-of-way, and its retention is necessary.

It is recommended that Preliminary AA AV4 Option and New AV4 Option be carried forward until the viability to construct AV3B along the UPRR right-of-way is determined. The optimal profile for this alternative would be developed during 15% design, with input from the City of Lancaster, the Rosamond Community Services District, and other key stakeholders, such as the University of Antelope Valley, to minimize the potential effects on land use, access,

Figure 1.4-3. Central Lancaster Vicinity



and circulation. The results of the additional study will be documented in the Draft EIR/S, either as part of a fully evaluated alternative/option, or in the discussion of alternatives considered, but ultimately not carried forward for full EIR/S analysis.

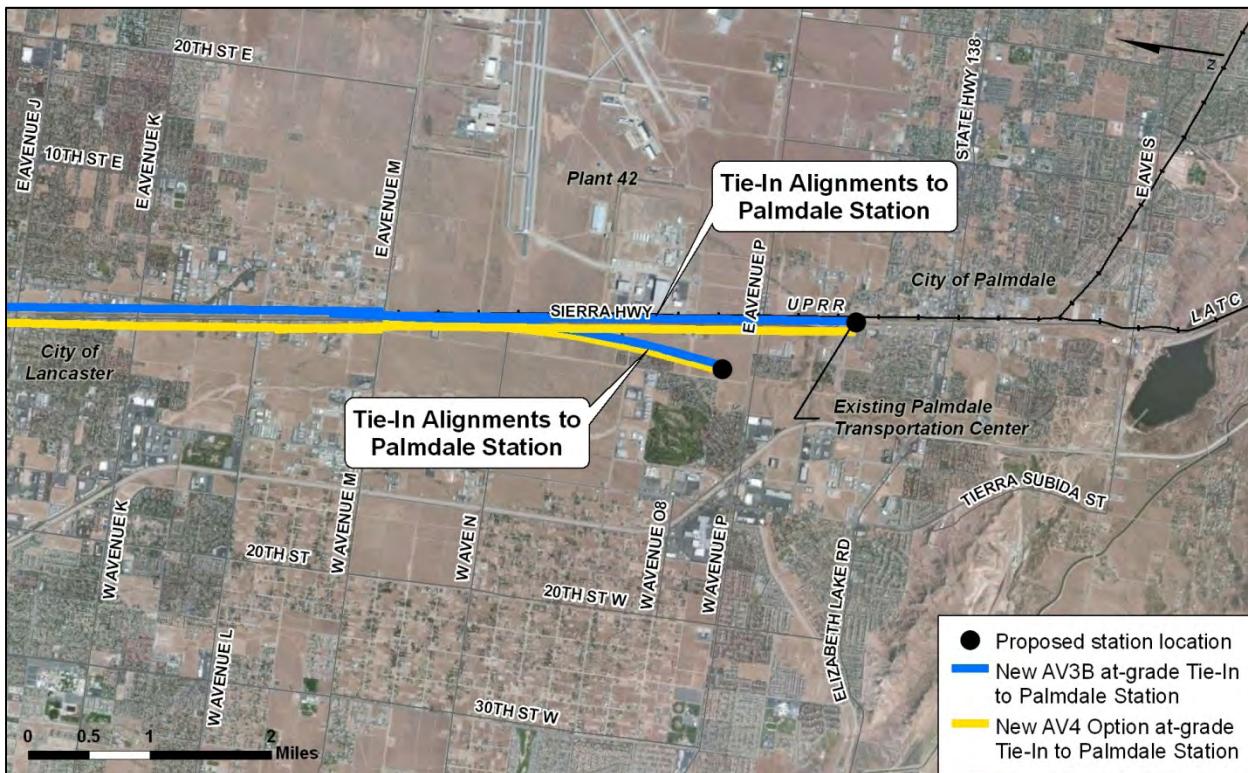
Palmdale Station Tie-ins

Palmdale Station Tie-ins join the AV alternatives with the two possible HST station locations in Palmdale. The tie-ins would begin south of Avenue M and continue approximately 2 to 3 miles to provide a connection between the AV3B or AV4 Option, and each station location (Figure 1.4-4). The eastern station location is along the UPRR tracks at the existing Palmdale Transportation Center (Metrolink); and the western location is in an undeveloped area north of Avenue P. Although they were not evaluated in this Supplemental AA, conceptual plan and profiles drawings of the tie-ins connecting the Bakersfield-Palmdale alternatives at Avenue M with the two possible station locations in Palmdale are included in the plan and profile drawings in Appendix D, Volume 2. The tie-ins will be further studied during the next phase of engineering (15% design) and environmental review.

Note that the tie-ins design to the existing Palmdale Transportation Center would traverse UPRR property.

The tie-in to the other potential Palmdale Station location would traverse Air Force property. Redesign of this tie-in to avoid such traversal of Air Force property is being studied.

Figure 1.4-4. Avenue M to Palmdale Station Tie-ins



2.0 Recommendations

The following recommendations are being made to the Authority Board, based on the evaluations presented for the Edison, Tehachapi, and Antelope Valley Subsections.

Edison Subsection

- Carry forward Preliminary AA E2B (all elevated) and New E2 (close to grade), working with Caltrans, the County, and other key stakeholders to develop the optimal profile for E2.
- Withdraw Preliminary AA E2A from further consideration. (E2A is the same horizontal alignment as E2B, but only partially elevated.) E2A displaces similar acreages of agricultural land and other uses, and causes more extensive reconstruction of multiple SR 58 interchanges than New E2.
- Carry forward Preliminary AA E4 (all elevated) and New E4 (primarily at grade) to determine the optimal profile; and to minimize impacts to the community of Edison and to agricultural businesses along Edison Highway.

Tehachapi Subsection

- Carry forward Preliminary AA T3-1 to assess potential environmental impacts and benefits associated with viaducts and tunnels in this alternative.
- Carry forward New T3, which has a shorter route and steeper gradients. This limits the length of tunnels and viaducts relative to the Preliminary AA alternatives.

- Carry forward and refine Preliminary AA T3-2 using the same gradient variances as applied to the design of New T3.
- Withdraw Preliminary AA T3-B and Preliminary AA T3-2B (phase-break alternatives) from further consideration.

Antelope Valley Subsection

- Carry forward Preliminary AA AV3B and New AV3B; carry forward Preliminary AA AV4 Option and New AV4 Option. Work with key stakeholders, including the UPRR, to determine the optimal profile for the AV3B and New AV4 Option alternatives.

The recommendations are illustrated on Figure 2.0-1.

Figure 2.0-1. Bakersfield to Palmdale Section: Alternatives Recommended to Be Carried Forward

